Docket No.: 566.43181X00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Takashige IWAMURA et al.

Serial No. 10/676,121

Filed: October 2, 2003

For: MULTI-SITE REMOTE-COPY SYSTEM

SUPPLEMENTAL REQUEST FOR RECONSIDERATION

June 21, 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Supplemental to the Request for Reconsideration filed on May 31, 2005, in view of the meeting between Mr. Brundidge and Mr. Laufer held on June 9, 2005 clarifying issues related to the granting of Petitions to Make Special, Applicants submit the following additional remarks.

It is submitted that the cited references, whether considered alone or in combination, fail to disclose or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to disclose or suggest in combination with the other limitations recited in the claims:

a first feature of the present invention as recited in independent claim 1 wherein the storage subsystem transfers content of data update into a first storage area among the plural storage areas, in which the data have been

duplicated and written, to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and wherein the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas, in which the data have been duplicated and written, to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed;

a second feature of the present invention as recited in independent claim 5 including transferring update data of the first storage area to the second site by a synchronous remote copy, and transferring update data of the second storage area to the third site by an asynchronous remote copy;

a third feature of the present invention as recited in independent claim 13 wherein the storage subsystem transfers update data into the first storage area and update data into the second storage area to a second storage subsystem connected to the storage subsystem by a synchronous remote copy, and wherein the computer transfers the log of a database to a second computer connected to the computer; and

a fourth feature of the present invention as recited in independent claim 14 including writing a log of a database into a first storage area of a storage subsystem of the first site by a computer included in the first site and storing data of the database into a second storage area of the storage subsystem of the first site, and transferring update data into the first storage area and update data into the second storage area to the second site by the storage subsystem using a

synchronous remote copy; and transferring the log to the third site by the computer.

To the extent applicable to the present Petition, Applicants submit that although the distinguishing feature(s) may represent a substantial portion of the claimed invention, the claimed invention including said feature(s) and their inter-operation provides a novel storage system and system and method related to or implemented in or by said storage system not taught or suggested by any of the references of record.

The references considered most closely related to the claimed invention are briefly discussed below:

U.S. Patent Publication No. 2004/0024975 A1 (Morishita et al.) discloses information about remote copy target volumes of other storage systems 2 each having one and the same original volume V1 is registered for each remote copy target volume in advance. When there occurs a failure in a copy source storage system 2, a copy source volume for remote copy target volumes using the storage system 2 having a failure as their copy source is selected newly from the registered copy source volumes, and remote copy is resumed. However, Morishita et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a

third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Morishita et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent Publication No. 2004/0153719 A1 (Achiwa et al.) discloses an information processing system that includes three storage apparatuses installed on three sites for the purpose of disaster recovery. The three storage apparatuses can be accessed by three information processing apparatuses, respectively, that are configured in a cluster. One of the storage apparatuses is set as a replication source and the other two storage apparatuses are set as replication destinations. The two storage apparatuses that are set as replication destinations manage a copy of data stored in the storage apparatus that is set as the replication source. In association with an execution of a failover on the information processing apparatus side, settings of the storage apparatuses as the replication source and replication destinations are automatically changed such that the storage apparatus that is set as the replication source would function as a replication destination, and one of the storage apparatuses that are set as the replication destinations would function as a replication source.

However, Achiwa et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Achiwa et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 5,937,414 (Souder et al.) discloses a method and apparatus for replicating data among sites that allows changes to the same body of data to be replicated synchronously to some destination sites and asynchronously to other destination sites. Such mixed propagation configurations allow synchronous updating to selected remote copies of replicated data where data integrity is a high priority, and asynchronous propagation to remaining copies of replicated data in order to allow transactions to be committed locally regardless of whether the transaction is committed at a

remote copy of the replicated data. The propagation mode is selectable by a user on a site-to-site basis for each replicated body of data, thus providing a mix of availability and consistency that is not possible in purely synchronous or purely asynchronous replication systems. However, Souder et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Souder et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 5,555,371 (Duyanovich et al.) discloses primary and secondary data processing systems that are coupled via a communication system. Data storage in both systems is provided by a log structured array (LSA) system that stores data in compressed form. Each time data are updated within LSA, the updated data are stored in a data storage location different from the

original data. Selected data recorded in a primary data storage of the primary system is remote dual copied to the secondary system for congruent storage in a secondary data storage, such as for disaster recovery purposes. The primary systems creates a remote copying session. Within such remote copying session, a series of "pending write update" sessions are ESTABLISHED. All data updated within each pending write update session is a consistency group of data. Within each pending write update session update data are retentively stored in both the primary and secondary systems (such as in a non-volatile cache). Addressability of such update data within a pending write update session is through separate pending write directories. The main (primary and secondary) directory for data is not updated such that all original (not updated) data are addressable. A COMMIT command terminates each pending write update session. Congruence of the sequence of updating in the primary system is maintained in the secondary system updating procedure. However, Duyanovich et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Duyanovich et al. does not disclose or suggest the above described first feature

of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 5,615,329 (Kern et al.) discloses a remote data shadowing system provides synchronous, storage based, real time disaster recovery wherein a secondary site is located remote from the primary site. An error recovery program at the primary site quiesces applications running thereat for performing error recovery procedures and signaling both primary and secondary locations that failed duplex has occurred. The error recovery program determines the cause of failed duplex, and if error recovery is successful, duplex mode is resumed. If the error recovery program is unable to perform error recovery successfully, then further write updates at the primary site are prohibited and an error message is communicated to operators at both the primary and secondary sites. However, Kern et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the

storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Kern et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent Nos. 6,477,627, 6,587,935 (Ofek) disclose a data processing network including a local system and a geographically remote system. Each of the local and remote systems includes a data storage facility. The remote data storage facility mirrors the local data storage facility. In a normal operating mode, the local and remote systems operate in near synchronism or in synchronism. In an alternate operating mode, writing operations at the local system immediately update the storage devices in the local data storage facility. Transfers of corresponding data to the remote data storage facility are made independently of and asynchronously with respect to the operation of the local system. However, Ofek does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage

subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Ofek does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent No. 6,813,683 (Tabuchi et al.) disk subsystem assures the sequence and the coherence of data updating with two or more disk subsystems is provided with an asynchronous remote copy function. A main center includes a computer system having the configuration of slave subsystems connected with a master disk subsystem. It secures the coherence between data at the main center and the remote center at the temporary suspension by repeating temporary suspension and release of the temporary suspension of the remote copy by the master subsystem at predetermined opportunities. It also repeats temporary suspension and release of the temporary suspension of the remote copy by slave subsystems connected to it. However, Tabuchi et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the

storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Tabuchi et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

U.S. Patent Publication No. 2003/0200387 A1 (Urabe et al.) discloses a synchronization confirmation method required for operation of a database is provided to a host device connected to a disk device which provides remote asynchronous data transfer. Immediately after commit of write data, an application of the host device issues a sync command which requires synchronization confirmation. A disk control device notifies the host device of a number concerning latest data received from the host device of a local side and a number concerning latest data received by a remote side. When the two numbers have coincided with each other, the host device judges the commit operation to have been completed. However, Urabe et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second storage subsystem connected to the storage subsystem before a request of the computer for the

data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Urabe et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

European Patent Application 1 283 469 A2 (Nakano et al.) discloses two data centers located in the vicinity are connected using a synchronous transfer copy function, and one of the data centers is coupled with a third data center disposed at a remote location by an asynchronous remote copying function. The order whereat a storage sub-system located in the vicinity has received data from a host is consistently guaranteed, and the third data center holds the data. Further, each storage sub-system includes a function whereby, during normal operation, data can be exchanged and the data update state can be obtained by the storage sub-systems located in the two data centers that do not directly engage in data transmission. However, Nakano et al. does not disclose, at a minimum, where a storage subsystem transfers content of data update into a first storage area among the plural storage areas to a second

storage subsystem connected to the storage subsystem before a request of the computer for the data update to the storage area is completed, and/or where the storage subsystem transfers the content of the data update into a second storage area among the plural storage areas to a third storage subsystem connected to the storage subsystem after a request of the computer for the data update to the storage area is completed. More particularly, Nakano et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims.

Therefore, since the cited references fail to disclose or suggest the above described first feature of the present invention as recited in independent claim 1, the above described second feature of the present invention as recited in independent claim 5, the above described third feature of the present invention as recited in independent claim 13 and the above described fourth feature of the present invention as recited in independent claim 14, in combination with the other limitations recited in each of the independent claims, it is submitted that all of the claims are patentable over the cited references whether said references are taken individually or in combination with each other.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

Respectfully submitted,

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